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RESOURCES

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CONTENTS

CONTENTS (Continued) Page

LACK OF EXPLOITATION OF HOT SPRINGS ALONG BAM CRITICIZED

Moscow KOMSOMOL'SKAYA PRAVDA in Russian 8 Sep 79 p 2

[Article by Ye. Pinneker, doctor of geological and mineralogical sciences and chairman, Commission for the Study of Subterranean Waters, Siberian Department, USSR Academy of Science, and V. Sungorkin, correspondent: "Hot Springs Along the BAM"]

[Text] Everyone is already familiar with the territory through which the Baykal-Amur Main Line (BAM) is being laid, and it is an area that is severe in all respects: frosts, permafrost, almost undending winters. Of course, the BAM is far from being like the Black Sea coast, but even if there are no warm seas there, it certainly does have warm lakes and rivers. We have in mind the so-called thermal subsurface waters. For a long time the local inhabitants have known of hot sources gushing from beneath the earth. When specialists were engaged to study them, it was discovered that for almost its entire length it is as if the BAM is being specially laid through regions that are extremely rich in subterranean hydrothermal resources.

Several hot creeks were immediately discovered in the vicinity of Severobaykal'sk. Hot springs flow near Kichera, Severomuysk, Vitim, Chara, Olekma, and Fevral'sk Stations. In all, 34,000 kilocalories of heat are discharged into the territory adjacent to the railway every second, through natural thermal water outlets. To produce that much heat it would be necessary to burn 170,000 tons of coal.

From the first, the discovered springs were sufficient to heat the BAM workers' settlements, sanitoria and greenhouses. But it is already the sixth year of work on the BAM and this natural wealth is not being used, for all practical purposes. What is the reason for this?

Maybe the thermal waters have not been studied enough? However, the hydrogeological scientists compiled original maps a long time ago, and these maps show the location, temperature,

chemical composition and "productivity" of each spring. These materials were not only sent to the organizations participating in the construction of the BAM, but were even published on a mass basis.

Maybe there is a lack of experience in using thermal waters for economic experience? Such experience is available. In Hungary and Bulgaria there are huge heating combines based on thermal springs. As far as the Soviet Union is concerned, the geothermal greenhouses on the Kamchatka Peninsula are not only being enlarged from year to year, but underground heat is also being adapted to heat roads, so that snow does not accumulate on them. And in the Caucasus the bowels of the Earth assist in heating whole cities. There is no need to go so far away: in the settlement of Il'inka in Buryatiya, there has been a greenhouse heated by a hot spring since 1969, and in the settlement of Goryachinsk -- only 200 kilometers from the BAM -- the heating of houses with thermal waters has begun.

Maybe it is economically unprofitable to "mess around" with natural heat on the BAM? On the contrary! We need to consider, on the one hand, the remoteness of the main line from agricultural regions and the long, cold winters, which means a great need for fuel and energy resources and unavoidable pollution of the air by numerous boilers and, on the other hand, the abundance of natural hot water near the settlements and stations. The Central Scientific Research and Experimental Planning Institute of Engineering Equipment for Cities calculated that the use of subterranean heat for the buildings and agricultural projects of the future Pitatelevskiy Health Resort in the southern part of Buryatiya will have an annual economic effect of 100,000 rubles. In the northern part of Buryatiya, on the BAM, the benefits will be even greater, because in that area the traditional types of fuel are very expensive.

However, the largest project Glavbamstroy's [possibly Main Administration for the Construction of the BAM] subunits have undertaken is the construction here and there of primitive bathhouses, of which they are very proud.

Who, then, must be seriously interested in thermal waters? It would seem that the answer is unambiguous: first of all, it must be the builders. They are the masters of the main line and their collectives will be working and living there for many years yet: more than 100,000 workers and their families and children. Therefore, the Institute of the Earth's Crust of the USSR Academy of Sciences' Siberian Department has sent suggestions on the use of thermal sources to Glavbamstroy. One and a half months later the following answer was received:

"Your suggestions have been discussed. . .and are of definite interest. However, considering the fact that Glavbamstroy's subordinates are contracting organizations that are doing construction and assembly work on the main line by order of the Ministry of Railroads, we are not able to guarantee the realization of these suggestions. Therefore, in order to solve the problem of the practical use of your suggestions on the utilization of thermal waters in the construction of the BAM, it is necessary that they be sent to the BAM Board of Directors at the Ministry of Railroads. . ."

The scientists were thinking about the prospects and about enlarging the studied reserves of thermal waters along the BAM. Therefore, the Siberian Department of the USSR Academy of Sciences turned for assistance to USSR Minister of the Gas Industry S.A. Orudzhev. In the ministry there are central boards that are concerned with the practical mastery of subterranean heat. The minister answered that it is possible to organize large-scale projects on the BAM, but that preliminary prospecting must be done be geologists in the promising sections, along with preliminary drilling. USSR Deputy Minister of Geology B.M. Zubarev reported, in turn: we are ready to do the drilling work, provided that we have a customer. However, no one is making any effort to be the customer. For 5 years, BAM's Board of Directors has also shown no interest in hot water sources. The circle has closed. . .

But the main point now, perhaps, is not even who should do what work in what sequence. It is possible that Mingazprom [Ministry of the Gas Industry] could take the initiative in the important matter of the integrated mastery of the BAM zone instead of making convenient references to its "neighbors." Actually, it is precisely Mingazprom that is charged with "responsibility for organizing the utilization of the Earth's deep heat throughout the country, including the development of plans for using the heat (considering the proposals of the Union Republics' Councils of Ministers and USSR ministries and departments), as well as the performance of work for exploratory and operational drilling for thermal waters, the setting up of wells, and their release for operation by the appropriate consuming organizations."

Thus, the history of the thermal waters along the BAM demonstrates yet another variant of departmental disinterestedness and dissociation. Even hot water cannot begin to flow from under a stone that no one will move.

However, here is a pleasant surprise: construction was begun this year on a greenhouse on one of the hot springs near the

settlement of Severomuysk. Some tunnelers -- who, by the way, are not part of the "department" of Glavbamstroy -- have taken it upon themselves to do this. We are fittingly happy about their beginning. However, they are building only a small and semiamateurish greenhouse, for the needs of their own organization, although the output of the spring they are using -- 7,200 liters per minute -- is sufficient to heat Severomuysk.

As is the case with all mineral waters, the hot waters along the BAM are also of medicinal value. In all, more than 100 mineral springs have been discovered and studied along the main line. Near Kirenga Station there is a spring from which water flows that is very similar to that of Yessentuki. Near Ul'nanom there is a creek similar to the well-known "Naftus," in Truskavets, and near Chara flow "Borzhom" and "Narzan" mineral water springs. There are no health resorts or sanatoria along the BAM (except for the old health resort in Ust'-Kut, the city where the main line begins) and, unfortunately, none can be expected in the near future, although doctors long ago demonstrated that for the health of the Siberian, it is frequently more useful to undergo treatment and rest in Siberia than to travel about the entire country, becoming fatigued because of the traveling and the change in climate and time zones. However, mineral water appears in the BAM stores only infrequently, and is bought immediately. Not much of it is sent from the other end of the country.

There is a popular rule in Glavbamstroy: "The Main Thing Is the Railroad!" By and large -- in our opinion -- this is not entirely accurate. All the same, the people are the main thing, and everything else is really secondary. Therefore, we have no doubts that sooner or later the "living water" along the BAM will be fully used to serve people: there will be thermal combines, and sanatoria, and swimming pools. Therefore, our job right now is to preserve the inviolability and purity of the places where these priceless springs gush from the earth. Paying attention to these oases is particularly important right now precisely because the construction work is now being done where the largest number of mineral springs are concentrated: between Baykal and the Olekma River. "Wild" health resorts have spontaneously sprung up. Here hundreds and thousands of people rest and "take the cure" without any medical supervision. The BAM workers' familiarity with the Chara hot spring is shown by the fact that they have broken several trees and displaced with a dump truck a corner of the cottage built for patients by some enthusiastic doctor in the 1930's.

We visited the Chara hot spring not long ago. There the house, darkened with age, still stands on the shore of a vast lake. Behind the house there is a picturesque mountain range with

Alpine glaciers and meadows. Around it there is a birch grove, and farther off, coniferous taiga. Across the lake we see the Chara River. In a word, this would be an excellent place for a health resort. A large settlement for geologists is being rapidly built 2 kilometers to the north of the hot spring; to the south -- across the river -- the railroad workers are furiously building. Every month more and more people are drawn to this hot spring, and its fame is growing: dozens of ailments have been successfully "cured" here. The cottage is full, and someone is building a second one that is just like it. Tents have been pitched, and the trees are being felled noiselessly.

How much more hot water will flow away unused?

11746
CSO: 1822

ARGUMENT ON WOODEN VERSUS CONCRETE POWER LINE POSTS CONTINUES

Moscow EKONOMICHESKAYA GAZETA in Russian No 45, Nov 79 p 17

[Article by V. Savel'yev: "It's Still the Same -- Wood, Concrete, or. . .?"]

[Text] An article entitled "Wood, Concrete, or. . .?" was published in issue No 16 of this weekly magazine. The editors received many comments and official responses about it.

L. Alferov, deputy chairman of the Presidium of the All-Russian Society for the Conservation of Natural Resources, wrote that out magazine is brining up an extremely urgent question about the replacement of wooden power transmission line poles with reinforced concrete ones. In the Latvian SSR alone, the annual conservation of 40,000 cubic meters of conifer lumber would keep about 200 hectares of forest from being cut down. A transition to reinforced concrete poles would be a step forward not only in the sense of saving our resources, but also an important measure for the conservation and rational utilization of our natural wealth in the light of the requirements of the 25th CPSU Congress and the principles of the USSR Constitution.

The author's opinion is also fully supported by RSFSR Deputy Minister of Forestry N. Prilepo. The replacement of wooden poles with reinforced concrete ones, he writes, will make it possible to achieve a sharp reduction in the consumption of high-quality wood raw material for this purpose and to replace it with less scarce and more durable materials.

The author of the article is completely correct when he points out the inadmissibility of using wood for poles, which under the conditions present in the Latvian SSR, must undoubtedly be replaced with reinforced concrete. This is the opinion of V. Yurasov, chief engineer of the USSR Ministry of the Construction Materials Industry's Glavzhelezobeton [Main Administration for the Manufacture of Reinforced Concrete Parts and

Structures]. Reinforced concrete posts have a number of decisive advantages: the industrial nature of the production process, operational reliability, simplicity of use and, finally, practically unlimited durability.

New and more economical designs have already been developed for 0.4-kilovolt power networks. The GOST [All-Union State Standard] has been sent to USSR Gosstroy for confirmation. At the same time, admits V. Yurasov, the opportunities for increasing pole output and reducing their material-intensiveness and the labor-intensiveness of their production are still inadequately used. Right now it is completely timely to raise the question of changing over to the highly mechanized, conveyor-type production of these poles. The complex of necessary measures will make it possible to insure a substantial increase in the output of posts and their economic effect.

And what does USSR Gosstroy think? V. Alekseyev, chief of the Division of Standard Planning and Organization of Design Research Work, reports that the lack of durability of the wooden poles used in the construction of power transmission lines results in an increase in material and labor costs for operating electric power networks. The reason for this is the low quality of the impregnation of the poles' wooden parts with antiseptics at many post-impregnation plants. A considerable number of wooden poles are, in general, not impregnated. As a result, the service life of such posts is only 6-12 years on some lines, instead of 25-50 years.

At the same time, calculations made by USSR Gosstroy's NIIES [Scientific Research Institute of Economics of Construction] and a number of branch scientific research and planning organizations show that the use of wooden poles with a service life of 30 years is the most economically effective with respect to both cost and adduced expenses for power transmission lines carrying 220 kilovolts or less.

Therefore, it is more nearly correct to raise the question not of replacing wooden poles with reinforced concrete ones, but of the necessity of industrialization of the production process and a sharp improvement in the quality of wooden poles (first of all, by organizing high-temperature drying of the pole blanks in petrolatum at the post-impregnation plants).

V. Zverev, deputy chief of the USSR Ministry of the Timber and Wood-Processing Industry's Technical Administration, also writes about the timeliness of the raising of the question about poles. The replacement of wooden poles for distributing electric networks with reinforced concrete ones can be one of

the effective reserves for saving wood raw material. As far as the choice of material is concerned, this should be decided by the USSR Ministry of Power and Electrification.

Indeed, that ministry's viewpoint on this matter is very important. It had to be stated by the ministry's leaders. The author received an answer (with a copy to this magazine's editors) from M. Pchelin, chief of the Main Administration of Scientific Research and Planning Organizations. Although it was softly written, the central board's leader simply rebuked Engineer V. Karasevich of Latvglavenergo (the author of the article): "You have neither construction cost indicators nor indicators for the actual operating costs." And more: "Without having any economic indicators, you could have turned. . .to foreign experience, where you will find reports on the extensive utilization of wood for electric power transmission line poles."

Well, an administration chief is free to choose both his words and the tone of his expression. However, in his answer to the editors he actually admits that the question "wood or concrete?" really exists. Moreover, he states, since 1964 the Ministry of Power and Electrification has been introducing reinforced concrete poles in rural electric power network construction.

However, although the central board chief limited himself to a reprimand of the article's author, Latvglavenergo's management went further. It instructed V. Karasevich "to give specific costs for constructing aerial lines carrying 0.4 kilovolts, using wooden and reinforced concrete poles, in a sectional view for the climatic regions of the Latvian SSR," and at the same time, "to give specific operating costs for 1 kilometer of 0.4-kilovolt aerial line for both wooden and reinforced concrete poles."

The engineer could not find the required data. The leadership of Latvglavenergo then reprimanded V. Karasevich. On top of everything else, his bonus was reduced by 50 percent. Thus, the expression about "the punishability of initiative" took on real meaning. One would think that the USSR Ministry of Power and Electrification and Latvglavenergo's party organization will make a fundamental appraisal of this fact.

11746
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POOR DEVELOPMENT OF POWER NETWORK IN FAR NORTHEAST DISCUSSED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 2 Oct 79 p 2

[Article by Valentina Zhurba, special correspondent for Magadanskaya and Kamchatskaya Oblasts and the Yakut ASSR: "An Argument About Kilowatts"]

[Text] The Architect's Opinion: "Well, besides business -- achieve more, produce more, grow more -- for a man there is also such a thing as 'just life.' In all likelihood there is certainly enough time to place the northerner' 'sweet dream' -- electric heating -- on the agenda. However, even that has its business side: so much less coal would be needed! Let's stop producing these pygmy-sized boiler rooms. That would free so many working hands, and in the North, y'know, that is the problem of problems. . ."

The Power Engineering Worker's Retort: "Here, just read this letter. With the introduction of the Kolymskaya GES, the Oblkomkhoz [Oblast Department of Municipal Services] proposes to convert the small settlements to electric heating because, they say, it's more civilized and economical. A typical example of the solution of a problem on an amateurish level. More advantageous? Only at first glance! Even in stable and settled regions, electric heating is dearer than dear, and for us in the North? Two-thirds of the power of that same Kolymskaya GES will go for the 'sweet dream.' But is that why it's being built?"

The Miner's Complaint: "The failure to deliver enough power for only one month and to only three producing regions cost us 200,000 rubles!"

Who is right here and who is guilty -- this is not our concern. First of all, this is what is interesting: no matter with whom one speaks about whatever problems there are in Kolyma and on the Chukotsk Peninsula, one invariably winds up with power

engineering. Why it is that it is just right now and why it is namely power engineering that has become the "stumbling block" are particularly understandable when we use the region's basic branch -- mining -- as an example.

One figure for comparison. In order to extract as much metal now as was extracted at the beginning of the five-year plan, the miner must dig up one-third more rock. But is he really expected to reach the level of past years? The "Basic Directions for the Development of the USSR's National Economy, 1976-1980" clearly states: "In the Far East, to insure the integrated development of the economy and increase the extraction of nonferrous, rare and precious metals. . ."

How to insure it? To increase it on what basis?

In order to process this "extra" third of rock mass, given the same level of excavating and washing technology, almost another 1,000 people must be engaged in mining work.

Powerful excavating equipment is needed. High-productiving washing equipment is needed: installations with a high throughput capacity, large hydraulic dredges and soil and sand pumps. However, these machines are not only more productive, they also consume more power. Their introduction will require an increase in electricity consumption by a factor of approximately 1.5. But even today there is not enough electricity.

"At the Bilibino Mining and Enrichment Combine on the Chukotsk Peninsula we tried to work with duplex washing units," says Yu. Antipanov, chief of Severovostokzoloto's [Northeast Gold-Mining Association] Technical Administration. "It is profitable: the productivity of a worker's labor increases by a factor of 1.5. However, such a unit uses twice as much electricity. It's all right in Bilibino, because there's an 'atomka' [atomic electric power station] nearby, but for others? Even in summer, at the height of the washing season, there are fields that are not connected to the power system or on 'starvation rations.' There is a battle for every kilowatt-hour."

The exploitation of ore deposits began to be speeded up during this five-year plan. Miner are a reliable raw material base for the stable, year-round extraction of precious metals. However, it is also an extremely energy-intensive production process. To stop a concentrating factory for even an hour, if you will, is an entirely different matter from turning off a washing unit. At "Dukat," complications appeared even as the equipment was being run in -- there was not enough electricity. Fully insuring the operation of a mine means to "plant" all the

surrounding "fields." It is hoped that the introduction of the Kolymskaya GES will take care of this.

And how do the power engineers themselves evaluate the situation?

"If we talk about Kolyma, here we have succeeded in adding considerable capacities in 3 years," says M. Frank, chief of the Division of Prospective Development of Power Engineering of Magadanenergo [Magadan Regional Administration of Power System Management]. "The expansion of the Magadanskaya TETs has been completed and the introduction of new capacities at the Arkagalinskaya GRES -- the main supplier of electricity for all the central producing regions -- is moving toward completion. So we, you might say, can hold out for awhile, although next year will be a rough one."

The "we can hold out for awhile" of the power engineers means the Kolymskaya GES. The first unit of this most northerly electric power station will go into operation next year. There is no reason to doubt that this is exactly what will happen. Last year, Kolymagesstroy's collective overfulfilled its plan for utilization of capital investments by 36 percent. One can say that this year's plan is already "in the bag." However, this has caused no special fanfare or complacency in the collective. Too much has to be done before the spring floods, when the main work will begin: the diversion of the Kolyma River and the erection of the dam.

However, even the timely start of the electric power station is still only half the battle. The situation that came about on the Chukotsk Peninsula with the introduction of the Bilibino AES is eloquent confirmation of that. And the situation, it must be said, is a very strange one.

Even the Bilibino Mining and Enrichment Combine, which -- you will remember -- has an "atomka" nearby, generates half the electricity it consumes with its own diesel electric power stations, which are extraordinarily unreliable and just as expensive. The miners' dreams that the introduction of the AES would mean the end of the diesels still remain dreams: the number of small-capacity local stations increases yearly.

This paradox appeared because of poor development of the network management. The local elements of the USSR Ministry of Power and Electrification are erecting the main power transmission lines quite slowly. The Bilibinskaya AES has been in operation for 3 years, but it still sends out only 110 kilovolts over a single LEP [power transmission line]. A similar situation is taking shape in Kolyma. Right now the construction

work is being completed on a LEP-220 from the Kolymskaya GES to Omsukchan, where -- in particular -- the "Dukat" mine is located. Since this region is not connected to Kolyma's common power system, one line will not be able to insure the reliable operation of the local enterprises. However, planning has not even begun on the second link.

For both the power engineers and the miners, the problems here are the same ones. Additional facilities are needed for the development of energy management. It is necessary to create powerful mechanized columns for the construction of LEP's. Finally, it is also necessary to renounce the habit of doing everything "hastily."

How can we talk about creating a reliable power base when even the main branch in the area -- mining -- does not have a prospective plan for the development of the power supply system? Specialists say that the cost of such a plan would be 20,000 rubles. Every year Severovostokzoloto has heated arguments with the USSR Ministry of Nonferrous Metallurgy about this modest sum. And, every year, the oblast's mining enterprises lose hundreds of thousands of rubles, through failure to receive enough kilowatts of electricity, through overloads on the substations, through losses in the networks.

As we can see, before expecting miracles from the miners, it is necessary to provide for the advance development of power engineering. No matter how great the value of the Bilibinskaya AES and the Kolymskaya GES to the region, they are only (so to speak) the first legs in the creation of a modern power base for the Northeast. The question of the construction of a new GES on the Kolyma River is still waiting for an answer. A "Plan for the Utilization of the Hydraulic Resources of the Rivers on the Chukotsk Peninsula" has been discussed and approved, with its first priority being the construction of the powerful Amguemskaya GES. The erection of new stations and the simultaneous development of network management will make it possible to create a reliable base for the extraction of wealth from where it is stored underground.

Let us remember: the decisions of the party congress mentioned the integrated development of this area. The foundations for this development are being laid right now. Meanwhile, the problems of power engineering are equally the problems of the area's plant collectives -- to grow and get stronger; the builders -- to strengthen the construction industry's base; the rural workers -- their efforts to supply the populace with local products in every way possible is forcing them to change over to an industrial basis for doing business. The northerners would not like to bury their "sweet dream" entirely: the program for mastering the North includes conveniences, and comforts, and a civilized life.

11746
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CREATION OF AES CONSTRUCTION COMBINES APPROVED

Kiev RABOCHAYA GAZETA in Russian 27 Oct 79 p 2

[Article by I. Barkov, deputy chief engineer, Odessa branch, Orgenergostroy, and V. Khizgilov, chief, Patent Information Division, Orgenergostroy: "Conveyor-Belt AES's"]

[Text] By analogy with house-building combines, atomic electric power station construction combines (AESK) are being organized in this country (and our republic). At the editors' requests, this fact is discussed by two specialists from the Odessa branch of Orgenergostroy [All-Union Institute for the Planning of Electric Power Projects].

How to build atomic electric power stations more quickly and cheaply? This question is now troubling everyone engaged in power system construction in this country. At the end of the 10th Five-Year Plan, almost every second kilowatt-hour of electricity will be obtained from the most progressive source; that is, atomic energy. Right now the Chernobyl'skaya, Yuzhno-Ukrainskaya, Rovenskaya, Khmel'nitskaya and Zaporozhskaya AES's are being built here in the Ukraine. For the future, plans are being made to change over to the more efficient fast-neutron reactors.

Meanwhile, AES's are superior to thermal electric power stations in specific consumption of concrete, metal, cable and other materials per unit of installed capacity. Take, for example, the power "heart" of a station: the atomic reactor. It is full of structures made of monolithic concrete, reinforcement and steel facing that restrain the vast energy of the nuclear reaction and do not allow it to force its way out even in an emergency situation. Of all the structures in an AES, the reactor complex is the most labor-intensive one for the builder.

It is a well-known fact that a construction project begins with a plan. And it is on the plan's perfection that more than 60 percent of the work's labor-intensiveness depends. The degree of development of the industrial base for construction, the engineering preparations, the machine-worker ratio (with modern equipment), and the scientific organization of labor play a huge role when taken together. Here someone had an idea: why not use the progressive experience of house builders? Just think of house-building combines! There they manufacture panels, deliver them to the construction site and install the slity [translation unknown] in a unified production flow. The work is done according to an hourly time-table and frequently without any intermediate storage of the designs or, so to speak, "on the run."

The Odessa branch of Orgenergostroy and the All-Union Soyuzatomenergostroy Association made the following suggestion: to create AESK's, or atomic electric power station construction combines. The board of the USSR Ministry of Power and Electrification approved this proposal. It is necessary to say here that in our branch organization we had already amassed a certain amount of experience in organizing the construction of AES's, in our work on the Kurskaya and Yuzhno-Ukrainskaya units. Now the collective has been assigned the task of planning the industrial-production bases for AESK's.

We can already say that two components of the base will be a plant for manufacturing special reactor complex units and an administration of production and equipment outfitting, which also has a transportation section. Special AESK installation administrations will work on the electric power station construction sites. It has been calculated that the economic effect of the creation of AESK's will be more than 3 million rubles per year.

So, everything has been decided, and the only thing left to do is to implement the decisions. Here is the problem, however: plans for modern AES's (with capacities of 1 million kilowatts or more), with extensive utilization of prefabricated designs, are only now being developed, so that it is necessary to build the AESK bases immediately. They must be planned according to the predicted product mix. Here is where the complications come in: there are constant refinements and alterations in AESK technology as the basic technological documentation for series-produced power units is published.

The Zaporozhskaya AESK is now being set up. The starting complex of its first stage is fully supplied with planning documentation and there are specifications for ordering production

equipment. The plan for a second combine is already distinguished by a great improvement: here the layout of the main housing has been improved and the size of the production area reduced by 11 percent in comparison with the Zaporozhskaya version. As a result, the capital investments will be reduced by 2.5 million rubles. Reuse of the drawings from this plan for the Khmel'nitskaya AESK will make it possible to organize the integrated execution of the zero-cycle work and the laying of the engineering networks, which will reduce the construction costs considerably.

On the basis of a decision made at the 33d session of CEMA, the Khmel'nitskaya AES is being built in cooperation with fraternal socialist countries. Our most important goal is the timely preparation of an economical and reliable AESK plan that conforms to present requirements.

11746
CSO: 1822

NEW POWER TRANSMISSION LINE IN CHITINSKAYA OBLAST DESCRIBED

Moscow IZVESTIYA in Russian 10 Oct 79 p 1

[Article by A. Kleba, correspondent]

[Text] Assemblers from the Vostoksibelektroset'stroy trust have released the Lesnaya Substation for operation. This substation, which is located in a pass in the Yablonovyy Range, is the largest in the Trans-Baykal area.

This substation closes the final link in a reliable power supply system for the Trans-Siberian Railway over the very difficult 400-kilometer section from Petrovskiy Zavod to Chita. The line is now open for heavy trains, and speeds will increase. All of Uletovskiy Rayon will be supplied with electricity, along with the Tataurovskiy coal-producing area (when it goes into operation).

"Having finished this project, the mechanized columns immediately moved on to new sections," reported N. Petrov, the trust's administrator. "New power features along the trace include a power transmission line from the Gusinoozerskaya GRES to Petrovskiy Zavod. Chitinskaya Oblast's power system will receive up to 80,000 additional kilowatts over this line."

Vostoksibelektroset'stroy's collective is working in the vast spaces of Siberia and Yakutiya. However, its main field of activity is the Baykal-Amur Main Line. In 5 years, more than 1,000 kilometers of 35-, 110- and 220-kilovolt lines have been put in place along the railway. Because of the work done by the hands of these expert tunnelers, power from the Zeya River is sent to Tynda, while electricity from the Ust'-Ilimskaya GES can reach the face of the Baykal'skiy Tunnel.

These selfless people stride swiftly across taiga, swamps and bald mountain peaks. Every day the trust's assemblers erect

poles in groups of five and hang wires from them with the help of helicopters. One of the most difficult sections -- the crossing of the Severomuyskiy Range -- will be finished in 2 months. This year, 870 kilometers of silvery line will be put in place above the taiga -- more than was installed in the last 3 years put together! All of the stations in the western section of the Baykal-Amur Main Line will receive electricity in the near future, while the Tynda-Neryungri power line will go into permanent operation in the central section.

All of this will make it possible to curtail the production of expensive energy by diesel electric power stations by more than 50,000 kilowatts, free about 1,000 people, and make it possible to save almost 5 million rubles.

"In our plans," says N. Petrov, "is the construction of a unique 2-kilometer section through the Zeyskaya GES's reservoir. Before the end of the five-year plan, much more will be done in Irkutskaya Oblast, also. By the way, that oblast is the most energy-saturated one in the country. In the next five-year plan, the consumption of electricity will increase considerably in this area."

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PROBLEMS OF DEVELOPING EQUIPMENT FOR THERMONUCLEAR POWERPLANTS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 17 Nov 79 p 2

[Author: I. Glebov, academician]

[Abstract] Technical and engineering problems connected with the development of equipment for future thermonuclear electric powerplants are discussed at length. Research is being carried at his institute--the All-Union Scientific Research Institute of Electrical Machine Building. One problem is the development of generators with a capacity of 2,500-3,000 megawatts, which will require an improved cooling system. Noting that two of the largest present-day turbogenerators have capacities of 800 and 1,200 megawatts each, the author projects that a capacity of about 2,500 megawatts is probably the limit for this type of equipment. To exceed this limit, generators for thermonuclear plants will utilize the principle of superconductivity. As opposed to the 800-megawatt generator, for example, which is water-cooled, future generators will have liquid helium circulating inside windings made of a niobium-titanium alloy. This should make it possible to reduce the mass of the generator by as much as four times. Cryostats will be used to prevent evaporation of the helium.

Another problem with this equipment is confinement of the plasma, which must be heated to 100 million degrees. One solution involves the development of super-conductor magnetic systems such as the one used in the "Tokamak-7" experimental reactor, recently implemented at the Institute of Atomic Energy imeni Kurchatov. A flywheel accumulator developed jointly by the author's institute and the "Elektrosila" Association contains a small electric motor which revs up the flywheel for about 15 minutes. The wheel is then engaged with a generator to produce about 1,000 megawatts of energy in several moments. Calling the use of pulsed fields an easier method of confining the plasma, the author describes pulsed magnetic systems as solenoids fed from high-capacity accumulators. He says that these systems must be equipped with switching apparatus capable of redistributing millions of amperes of current in fractions of a second.

Finally, commenting on questions of increasing the reliability and durability of the future equipment, the author notes that this equipment will require materials capable of absorbing the strongest vibrations. Observing that

the relatively lightweight rotors of the newest generators are less stable in emergency situations, he reports that high-speed thyristor regulating systems are being developed to compensate for this drawback of superhigh-capacity generators. Superconductor energy accumulators consisting of a gigantic coil with a superconducting winding supplied with direct current could be developed to meet increased demands for power in peak hours of use. Calculations show that an accumulator 300 meters in diameter and approximately 100 meters high could store enough energy to replace a 2,500-megawatt plant for several peak hours.

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NUCLEAR POWER IN USSR AND EASTERN BLOC

Duesseldorf WIRTSCHAFTWOCHE in German No 46, 12 Nov 79 pp 64, 68, 70, 71, 74, 76

[Unattributed article: "From Lake Baikal to the Elbe River"]

> [Text] It was with surprise that the West, which is now rather restless in nuclear-policy terms, registered the first official warning given by leading Soviet economists about the dangers of nuclear power in the Central Committee organ KOMMUNIST. Unimpressed by atomic accidents--even trouble in the nuclear power plants in the Western world is being played down in the eastern press--the CEMA is briskly expanding its atomic energy system.

The Moscow party newspaper PRAVDA described an idyllic fishing situation north of the Arctic Circle. The scene of the action is Lake Imandra on Kola Peninsula, on whose shores an atomic power plant with 940 Megawatts has been in operation since 1973. Where the cooling water again flows into the lake, ichthyologists, the scientists who specialize in the knowledge on fish, started breeding trout because Lake Imandra here --as PRAVDA explained--does not freeze "even during the worst winter."

The water flowing back from the atomic power plant is "completely harmless" and the "radioactivity in the tissue of the trout bred here is lower than in other fish populating the lake."

Something that may be advantageous for the flora and fauna in these latitudes elsewhere becomes a disaster for them. The cooling water from the Rheinsberg 80-Megawatt atomic pile, which has been operating there in the GDR since 1967 and which was delivered by the USSR has upset the biological balance of Lake Stechlin.

Some members of Radio Budapest listening audience, better informed than their bloc neighbors, on the other hand recently, during a popular broadcast, asked worried questions about the Paks Nuclear Power Plant which,

115 kilometers away from Budapest, is being built on the right bank of the Danube also with Soviet help and whose first reactor is to be in operation by the end of 1980. They wanted to know whether the plant, which is supposed to have four 440-Megawatt blocks, might not heat the Danube water up so badly "that all life in the river would be killed." The worried questions from the listeners were answered objectively to calm the audience.

The Bulgarian People's Republic--if we are to believe enthusiastic newspaper reports—has had a new heart for the past 5 years: The 880-Megawatt atomic power plant at Kosloduj on the Danube, which was commissioned in 1974 and which is likewise based on a Soviet model. The "Republic's atomic heart" so far has helped save more than nine million tons of hard coal and by 1980 is supposed to supply at least one-third of Bulgaria's current. After that, two more reactors at 440-Megawatt, each, are to be added. The "showcase of the Bulgarian energy industry," a "child of socialist economic integration," according to an enthusiastic story in a Soviet newspaper, does not even suffer from the basic trouble encountered in all planned economy. "There, they do not know what it means not to fulfill the plan," so says a local Bulgarian newspaper. Something that is so unusual obviously deserves special appreciation. Even poems have been written about the Bulgarian atomic pile

The Slovak CP newspaper PRAVDA ("Atomic Power Plants Are Not Atomic Bombs") was either not as well informed or it lied when it assured of its readers at one time that atomic power plants both in the East and the West are "100 percent safe." At that time there had already been two serious accidents in the Slovak Atomic Power Plant at Jaslovske Bohunice, where work was being done for 15 years on the A-1 experimental reactor. Early in 1976, two technicians were asphyxiated by escaping carbon dioxide in this plant which was placed in operation in 1973. Early in 1977, radioactive cooling water contaminated a brook. Result: The A-1 reactor was closed down.

The news of the accident came at the end of 1978 from the "Charter 77" Prague civil rights movement according to which the topic of safety in Czechoslovakia is handled "in an absolutely inadequate fashion." The Charter on the other hand promised henceforth to devote "uncensored attention" to this problem.

Censored disregard is precisely what the Slovak media devoted also to the near-disaster of March-April at Harrisburg in the United States. They did not waste a single word on the top news item that came out of the West for a whole week. Radio and television in Prague likewise maintained complete silence and only a handful of supraregional newspapers somehow managed to print very short stories on the back pages. Only shortly before Soviet premier Alekse; Kosygin landed in Prague on 22 May, in order to talk to the Czechoslovaks primarily about cooperation questions in the area of nuclear energy development, did the party organ

RUDE PRAVO mention the Harrisburg incident. Every technological progress, the newspaper informed any possible doubters, is accompanied by risks, damage, and accidents and there is no replacement for nuclear power.

In the presence of Kosygin, who used this opportunity to recommend "drastic oil and gasoline savings measures" not only to Czechoslovakia, the first industrial reactor, the V-1, was switched to the planned capacity of 440 Megawatts; it is located at Jaslovske Bohunice and was built in Leningrad; it was shipped in via the Black Sea port of Ilyichevsk and the Danube. Under the Soviet aegis, Czechoslovakia will develop into the second-biggest producer of equipment for nuclear power plants in the East Bloc.

Differentiated Information Policy

The information policy of the CEMA countries in matters relating to nuclear energy is certainly differentiated, as could be seen in connection with the Harrisburg accident. It extends from "censored disregard" in Czechoslovakia, the GDR, the USSR, in Bulgaria and Romania,—which on that issue, as an exception, completely conforms with the Bloc—all the way to "uncensored attention," such as it is practiced above all in Yugoslavia. To be sure, Yugoslavia is only associated with the CEMA but 2 years ago decided to cooperate in the nuclear energy program of the CEMA because of continuing difficulties with the American firm of Westinghouse Electric Company which is building the first Yugoslav Atomic Power Plant in Krsko (660-Megawatts) and with the Carter Administration which would like to place certain requirements upon the Yugoslavs.

The most important Soviet, East German, Czechoslovak, Bulgarian, and Romanian media—otherwise always inclined to play up Western failures big—this time decided to sit this one out, were very stingy with information, and completely refrained from making any comments. The situation is different in the case of the Poles, Hungarians, and Yugoslavs who for quite some time have been informed sufficiently objectively about nuclear energy problems.

The Hungarian atomic physicist Laszlo Jeki, questioned on Radio Budapest, readily admitted that atomic energy is dangerous. In answer to the question as to whether there is no antiatomic movement in Hungary, because nuclear power plants in socialist countries are safer, Jeki said that the safety problem is the same everywhere and that everybody is making an effort everywhere "to achieve maximum safety."

In Yugoslavia, Harrisburg possibly helped bring about the result that the country's second atomic power plant—which was supposed to go into operation according to plans in 1980 on the Island of Vir, off the Dalmatian coast—will not be built at all now. After protracted public protests, above all by the citizens of Zadar, who, according to the Belgrade publication POLITIKA, would rather do without nuclear power, "because we make a nice enough living from tourism and our hotels" and who instead want

"a clean lake and more hotels" the Zadar city assembly rejected the project unanimously in June. Now the second atomic power plant is to be built on the Sava and is to be commissioned in 1990.

The lesson, which Yugoslavia learned from Harrisburg according to POLITIKA is that the decision on broad-scale atomic energy utilization should be made only after detailed public discussions. The publication likewise would not want to rule out a plebiscite.

But while in the West and in Yugoslavia, the protest movements against the utilization of nuclear energy continues, a "patriotic movement" for its even faster utilization sprang up in the Ural Mountains. The occasion: The second industrial fast breeder (600 Megawatts) of the USSR, which has been under construction at the Kurchatov plant in Beloyarst as the third block for more than 10 years, simply is no closer to completion than it ever was. The commissioning date, originally scheduled for 1974-1975 already, has now been rescheduled "punctually" for 22 December 1979, the "Day of the Energy Industry"; and the admonition to display more patriotism is supposed to enable the technicians and scientists, the transport and construction workers to come up with better work performance.

Safe and clean, economical and progressive, environmentally safe and close to the people--these are the attributes which are above all doubts and with which the USSR and its currently closest allies picture the advantages of peaceful utilization of atomic energy. According to the dogma, it is not only safer under socialism but its fast development is also promoted as an expression of the system's superiority.

For Autarchy Through Atomic Energy

It is thus a citizen's first duty in the USSR to be for atomic power. The manner of reporting of course makes this duty easy for the Soviet people. They never learn anything about the mining of uranium ores, the deposit of the huge radioactive waste dumps, uranium enrichment, which is among the "dirtiest" processes, and about the final disposal of radioactive atomic waste. Domestic accidents continue to be covered by censor ship secrecy. Realistic cost calculations are not released in public.

The basic belief here is that current alone and, later on, heat from atomic power can fill the growing energy gaps in the East Bloc and can also solve the environmental problems which are coming up massively also in the socialist states due to conventional energy procurement. Atomic energy is supposed to guarantee the CEMA's autarchy in energy supply and is above all to relieve the USSR as the main supplier of energy raw materials. Soviet oil and gas extraction in Siberia, far from the consumption centers, is getting more and more difficult and more and more expensive--not at all according to plan, of course--and the transportation routes are getting longer all the time because new deposits are located

further and further to the east. This is why the USSR's fuel and energy shipments to the allies will, between 1981 and 1985, increase only by 20 percent (as against a 43-percent increase curing the current, Tenth 1976-1980 Five-Year Plan) and those deliveries are getting more expensive. Coal mining in the small CEMA countries is also possible only under growing difficulties. Energy directives and measures, partly of a drastic nature, therfore are even today a routine thing in the entire Bloc.

"The only way to solve the energy problem is--in addition to increased coal use--the rapid development of large-scale nuclear energy," lectured Dr Anatoliy Aleksandrov, president of the Soviet Academy of Sciences, in May, as he set the tone in the magazine PROBLEME DES FRIEDENS UND DES SOZIALISMUS which is also published in German in Prague. "The broad and manifold utilization of atomic energy constitutes long-range economic policy. Its task is to preserve petroleum and gas supply for a long time and to use them more efficiently than just for burning, that is to say, as raw materials for the chemical industry. This is why the opening of the gigantic energy resources of nuclear conversion constitutes an extremely important duty of scientists toward mankind."

The question as to the stories of radioactive atomic waste, which has heated passions in the West so much, according to Aleksandrov has found "a reliable engineering-technological solution." Whether that report is correct cannot be checked out. At any rate, the USSR so far had the saddest experience in the story of radioactive waste: In 1958, a waste dump exploded in the Urals and hundreds of people died, tens of thousands were radioactively contaminated.

Nevertheless, Andrey Sakharov, the prominent leader of the Soviet dissidents, an atmoic physicist and Nobel Peace Prize winner, in rare agreement with the scientific establishment of his country, pleads for atomic energy. While Aleksandrov had dismissed Western reporting on Harrisburg as "grossly exaggerated" and pictured it as manipulation by petroleum monopolies which are worried about their profits, manipulation due to stiff competition, Sakharov referred to it as "very much overblown" and termed the accident itself a "technical slipup."

Through the special exhibit on "The Peaceful Atom in the Countries of Socialism," which is currently being held in Moscow, the CEMA countries, with the USSR in the lead, are building a monument for their atomic cooperation. The latter began in 1955 with the first bilateral agreements and in 1956 with the founding of the United Nuclear Research Institute in Dubna; in 1960, it was continued with the creation of a "Permanent Commission for the Utilization of Atomic Energy for Peaceful Purposes" and it reached a temporary high point in June, during the 32nd session of the Council in Bucharest with the completion of a long-term target program in the area of energy, fuel, and raw material supply. At the end of June of that year, the CEMA countries decided, during their 33rd council meeting in Moscow, also to enter into an agreement on the

specialization of production of nuclear power plant equipment for 1981-1990.

It goes without saying that the USSR never tires of ceaselessly boasting of its "brotherly aid" for its partners also in this field. It supplies not only the nuclear engineering systems as such; for the past 20 years it has also been training the "atomic cadres" of the allies, so far totalling 20,000 technicians from Eastern Europe and Cuba. The teaching and training center at the Novovoronezhskiy Atomic Power Plant (1,525 Megawatts) on the Don, is used primarily as the atomic "cadre forge"; each year it provides basic and advanced training for 350 atomic technicians from the CEMA countries and an 1,000-Megawatt unit is now being mounted as the fifth block and it will be the first (!) Soviet reactor to get a reinforced explosion shield. The USSR supplies all partners with enriched uranium and takes the spent fuel rods back.

The USSR of course lost its past leading position in the broad-scale industrial utilization of atomic power. In October 1979, 12 nuclear power plants were in operation in the USSR whose installed capacity ranges from 5 Megawatts (Obninsk) all the way to 2,000 (Leningrad, Kursk, and Chernobyl) but which are partly still being expanded. Their total capacity is just about 10,000 Megawatts (1975: 4,700 Megawatts). Besides, ten additional plants with a total capacity of 25,000 Megawatts are under construction especially in the European part of the USSR for which the 25th CPSU Party Congress decided accelerated nuclear enegy development. This is probably also why some very recent doubts--as to the ecological feasibility of this site selection in heavily populated areas, such as it was reported quite surprisingly by two outstanding Societ scientists in Septebmer in KOMMUNIST, the organ of the CPSU Central Committee--will, for the time being, not be expressed in actual construction practice. This is so even if they are an indication of the fact that unity behind the scenes possibly is not as strong as it may seem in the light of the public statements of Anatoliy Aleksandrov.

One cannot accurately determine from Soviet data what the USSR wants to have ready or wants to build by 1980 or 1990. Sometimes there is talk of 17,000 Megawatts by 1980 and sometimes there is talk of 19,000 Megawatts. Some people hope to get a total capacity of 110,000 Megawatts by 1990 while others are planning on "up to 100,000."

The target of the Soviet energy planners is to obtain about one-third of the energy needed by 1990 on this side of the Ural Mountains from atomic power. The capacity planned for 1980, amounting to a maximum of about 19,000 Megawatts, would amount to a nuclear power share, out of the installed electrical capacity, of about 6 percent for the national average and would correspond to the share of nuclear energy produced in the Netherlands in 1977. The USSR above all uses PWRs of the VVER-440 type, which have so far been exported, the VVER-1000 type, whose prototype is being assembled in Novovoronezhskiy [power plant] and which is

also intended for export, as well as pressure-pipe reactors of the RBMK-1000 type which are to be found above all in the big atomic power plants in Leningrad, Kursk, and Chernobyl.

The three CEMA countries, which so far have been producing their own atomic energy--the GDR, Bulgaria, and Czechoslovakia--account for a total of 2,720 Megawatts (excluding the A-1 reactor of Czechoslovakia which apparently is still shut down). With just about 13,000 Megawatts, the share of nuclear energy out of the energy supply of the CEMA countries thus comes to 4 percent and therefore is precisely one-half that of the European community. The small CEMA countries, including Cuba--through cooperation with Yugoslavia--are planning an increase of 37,000 Megawatts by 1990. In addition, the USSR, together with the interested countries, will build two nuclear power plants of 4,000 Megawatts, each, on their western territory, from which current is to flow to the West.

The nuclear energy share out of the installed electrical capacity of those countries would then rise to 25 percent and in some countries it would be even higher. By 1990, Bulgaria wants to get half of its energy from atomic power, Czechoslovakia more than 40 percent, Hungary a good one-quarter, and Romania almost one-quarter. If the plan is carried out, then the CEMA countries by 1990 would, together, have 140,000-150,000 Megawatts available and thus could save 75 million tons of hard coal.

At the 89th session of the CEMA Executive Committee at the end of March in Moscow, the USSR, Poland, Czechoslovakia, and Hungary already negotiated details on the construction of the Khmelnitskiy Atomic Power Plant in the Ukraine, from which a 750-Kilovolt power line is to lead to Rzeszow in Poland. This R 1.5 billion project--half of which is to be financed by Poland, Czechoslovakia, and Hungary--is to get four PWRs of the VVER-1000 type. The USSR is doing the most important work and will operate the plant. Poland, Hungary, and Czechoslovakia deliver nuclear-technical equipment and get current in keeping with their financial aid.

The 750-Kilovolt power line ("LEP-750") is the "second shoulder" of the "Peace" eastern integrated energy system which for years has been totally overloaded and which is short of voltage especially during the cold season. It is to be further expanded by Poland, the GDR, Czechoslovakia, and Hungary. The "first shoulder" is considered to be the Vinnitsa Albertirsa "LEP-750" which was completed at the end of 1978 and which run for 842 kilometers from the Ukraine to Hungary and which is to be extended all the way to the boundary between Czechoslovakia and the GDR. These "energy trunk lines" and additional 750-Kilovolt lines are to complete the integrated energy system in such a manner that it will also be possible to supply Yugollavia and Western Europe. This is the first grid system which--as the Soviet press reports so enthusiastically--extends across two continents, from Lake Baikal to the Elbe, from the Arctic Ocean to the Black Sea.

The accomplishment of the ambitious plan between Lake Baikal and the Elbe, the Arctic Ocean and the Black Sea depends essentially on the efficiency of the cooperation agreement on division of labor in the CEMA which has now been concluded in Moscow.

The USSR, still the biggest producer of nuclear power plant equipment, is building the "Atommash" [atomic machinery] reactor factory in southern Russia according to the Tsimlyansk reservoir lake whose first construction phase in December 1978 went into operation with a delay of one year. Here, reactors of 1,000-Megawatts and corresponding turbines are to be produced in series, with up to eight units per year, starting in 1980-1981.

Czechoslovakia will turn out reactors of the VVER-440 type and will participate in the further development of the VVER-1000. For this purpose, Czechoslovakia will supply steam generators, main circulation pipelines, and pumps. The Skoda-Works in Pilsen [Plzen], which are now also specializing in electric machine-building, will build 19 reactors by 1985 for their own needs and for their partners. According to a report by Radio Prague, "it will not be long until we will also be exporting those reactors to Cuba." Besides, Czechoslovakia is one of the leaders in the development of fast breeders.

Bulgaria is building systems for biological protection and measurement instruments and, not far from the Kosloduj Atomic Power Plant, it is erecting a repair and spare parts factory which is also supposed to work for the partners. Hungary will deliver mechanisms for reactor operation, equipment for special water purification, and medical instruments; Poland will take care of the condensers, generator, and control measurement instruments while the GDR will contribute transportation equipment.

Romania participates rather little in the CEMA nuclear energy program. To be sure, Romania likewise has ambitious energy plans and originally 1,000 Megawatts were supposed to have been installed already in 1970. In the meantime it has been ascertained that the first Romanian plant will not be producing before the middle of the eighties. In the most recent Romanian long-term energy program, which is to be approved by the 12th Party Congress in November, it says that Romania will step up its cooperation in the area of nuclear energy with other countries, including capitalist countries. This cooperation has already begun: At the end of last year, the Romanians signed an agreement with Canada on a billion-dollar loan covering the delivery of four Canadian CANDU reactors at 600 Megawatts, each. Romanian atomic technicians are to be trained in Canada. According to Canadian information, Romania over the next 20 years wants to build 16 atomic power plants; some of them are to be built by the Canadians and others will be built by the Romanians on a license basis. Romania has also purchased a Soviet reactor which reportedly is supposed to be producing as of 1983. The country wants to have 40,000 Megawatts of atomic energy available by 1990.

Romania might possibly be making more progress with Canadian help than its neighbors are making with Soviet assistance. Past experience in the development of nuclear energy in the Soviet Union, a leading atomic power, shows that plans have never been met as yet. Even meeting reduced plans causes trouble. In 1971, the 24th CPSU Party Congress decided that capacities of about 30,000 Megawatts are to be installed by 1980-1982. In 1976, the 25th Party Congress scaled the ambitious goal for 1980 down to 19,000 Megwaatts. But only the stars will tell how the backlog of 10,000 Megawatts as of October 1979, is to be made up to reach 19,000 Megawatts within a year's time, although 5,000 Megawatts, each, are to be placed in operation in 1979 and 1980.

"The commissioning of energy capacities always falls behind the tasks established by the five-year plan," complained Moscow's deputy energy minister Falalayev once again in September in the government newspaper IZVESTIYA. Last year alone, 2,500 Megawatts were not installed in atomic power plants. Many and yet nobody can be blamed. It so happens that the Soviet atomic industry, especially its energy-machine-building sector, simply is not up to the demands of the planners, quite apart from the usual difficulties encountered in a planned economy and the hitherto unresolved technological problem. If we are to believe Falalayev, the USSR nuclear energy program calls for "new design solutions," for which however the "necessary theoretical and industrial base" does not exist as yet. Specialization and standardization leave much to be desired and there is a shortage of skilled manpower, while supplier and transportation problems are also creating trouble. According to Falalayev, "entirely new" cranes, concrete wagons and pumps as well as mixers are needed at the atomic power plant construction sites. Moscow likewise does not allow the rubles to be released so punctually either--as the deputy minister expressed in his reprimand.

It goes without saying that these difficulties also have an effect on the CEMA partners. They likewise cannot manage their plants and will hardly be able to reach the capacities of 7,000 Megawatts planned for 1980.

Nevertheless, the nuclear ambitions of the USSR go even further. It would dearly love to get a foothold on the world market. Early in 1978, it offered the Phillipines an atomic power plant. Russian technicians will build the first atomic piles for Libya, Iraq, and recently also Turkey. Italy was offered electrical current from Soviet atomic power plants. This is why the USSR is interested in Western atomic knowhow. It gets it either through scientific-technical cooperation agreements, such as with France in the area of breeder research, or through practical cooperation, such as with Finland, where the Soviet Loviisa-1 atomic pile, according to Finnish data, has been working mostly without any trouble for the past 2 years. After the commissioning of the Loviisa-2, which is planned for 1979, Finland will get 10 percent of its energy from there.

Loviisa of course is not exclusively of Soviet origin but happens to be a design featuring supplier shipments from several countries with a highly developed nuclear technology. Control systems, concrete casings, and refrigeration technology come from the United States, instruments come Canada and France, computers come from England. All of this is made available to the USSR in Loviisa and improves Soviet or Soviet-Finnish export opportunities.

The reliability of Loviisa as the fruit of Soviet-Finnish cooperation is being praised in the Soviet press as being without parallel. The Soviet citizen however is never told that the West also supplied parts here. Skeptics of course did admit that, according to the Moscow magazine LITERATURNAYA GAZETA, early in 1979, but the number of those skeptics keeps getting smaller and the number of those who believe in Loviisa supposedly keeps going up.

But Harrisburg has left traces also in Finland, although the anti-nuclear movement is relatively weak here. The construction of the fifth reactor from the USSR--on which negotiations were to be held already last summer--has been postponed for the time being. According to Finland's "energy policy council," the country could wait "at least until 1982" with the decision on building new and big atomic power plants.

5058
CSO: 1826

ELECTRIC POWER AND POWER EQUIPMENT

TRANSPORTATION PROBLEMS IN TRANSFORMER CONSTRUCTION INDUSTRY

Moscow IZVESTIYA in Russian 21 Oct 79 p 2

/Article by L. Khadzhinov, general director of the "Zaporozhtransformator" association: "The Technology of Success"/

[Text] For the industrial association "Zaporozhtransformator imeni V. I. Lenin", the past few months of the fourth year of the Five-Year Plan have been tense. The fulfillment of the socialist obligations (they were published in December, 1978 issues of IZVESTIYA) demanded great discipline from the collective. The Zaporozh'ye transformer builders stick fast to their word. The realization of production now amounts to more than a million rubles over the plan; in addition to this, all growth in the volume of production was achieved without an increase in the number of personnel. Almost half of the association's products are marked with the State seal of quality--for example, the high-power transformers, completed ahead of schedule, for the most important construction projects, such as the Sayano-Shushenskaya and Nurek GES's and the Leningrad AES.

The resolution of the CPSU Central Committee and the USSR Council of Ministers on improving the economic machinery has aroused the great interest and approval of the workers, engineers and technicians and was a new stage in the improvement of management at our enterprise as well.

The association actively participated in an economic experiment which insured non-stop work throughout the entire cycle--"from the idea to its inculcation." Over the course of several years we have had introduced a new form of planning, financing and economic stimulation, and we have had the introduction and assimilation of new techniques. A decrease in the cost price of production and additional profits in the form of an increment raise in the wholesale price of new products in a higher quality category served as sources for the formation of funds for the economic stimulus. The rate of allocation of these funds is determined in direct relation to the real economic effect experienced, first of all, by the consumer.

Here are some of the results of the experiment. The economic effect due to the utilization of new products has more than quadrupled in a decade, and has amounted to approximately six million rubles. The periods of their development and introduction decreased to almost two-thirds of the previous periods. In a short span of time there have been produced a unique, supercapacity power transformer for the Slavyanskaya GRES and autotransformers for electric transmission lines in the south of the Ukraine, for the Kostroma GRES and others.

This year our association arrived at a new stage of the economic experiment. The development of annual plans on the basis of stable economic standards, sanctioned for each year by the Five-Year Plan. This permits expanding the economic independence of the enterprise. In the Five-Year and annual Plans the economic effect "works" because of scientific-technical measures to increase the level of production, improve the organization of labor and improve management. A system for programmed, special-purpose planning of the technical progress was developed and introduced in our association. It is receiving further elaboration.

It is important to note that in improving the economic machinery and the management, as emphasized also in the resolution of the CPSU Central Committee and the USSR Council of Ministers, an important link is socialist competition. We have today 3,500 workers who have outpaced their personal Five-Year Plans by more than a month; 436 who have completed the tasks of four years of the Five-Year Plan; and 11 workers who have reported to the collective about completing the Five-Year Plan ahead of schedule. Among them are Vasiliy Kas'yanov, winder at the first transformer shop; Hero of Socialist Labor Nadezhda Lagno, insulator at the wire insulation shop; and electrical equipment installers Viktor Dolya and Yuriy Grin'ko.

It used to be that at the finishing stage, when the prepared product was being sent to the consumer, we experienced no small difficulties. Today, thanks to the close business collaboration with the rail workers of the Zaporozh'ye section of the Pridneprovsk line, discrepancies of any kind have become fewer. Previously, the business executive attributed half of his problems to the impossibility of "knocking out" the rail car, but now it is difficult to use this excuse, since the transport workers are doing a much better job. The programming of cars for the association and their timely delivery when loaded have been regulated. This has also placed particular responsibility on the workers of our association. They have put a stop to a wasteful practice; they would knock out a car, then not worry about anything else. We have improved the organization of the loading-unloading and transport-storage operations, curtailed heavy manual labor on the basis of complex mechanization, brought the transport-storage industry up to a modern technical level and introduced circular routing. We have improved the whole system of management of this important sector of production.

The efficient interaction between the association and the rail workers contributes to the more effective utilization of freight cars and reduce their layover time. Three years ago the average layover on the association's siding exceeded the established norm by almost one and a half times. This year, thanks to the complex of operation that I was talking about, we have managed to reduce the cars' layover by one hour as against the norm. The transportation of high- and super-power transformers demands specialized rolling stock--over-size load, multiaxle transporters.

At present we are acutely upset by the lack of 220-ton cargo capacity articulated transporters. The requirements of our association alone exceed the available rolling stock in the country. During the next year, to say nothing of the more distant prospects, the volume of power transformer production will increase significantly and transporting them will of course become more complicated. Therefore, it is necessary to more rapidly adjust the production of those transporters which are in such short supply. This should be done by the USSR Ministry of Heavy and Transport Machine Construction.

The Zaporozh'ye transformer builders have traditionally been proud of their product: its quantity and, mainly, its quality. They never let their customers down, they strive to do what they have been entrusted to do on schedule and on a high level. It is thought that adjusting and strengthening this last transportation link in the technological chain will to no small degree affect the efficiency and the quality of our association's work.

9512
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RED TAPE BLAMED IN PROJECT FAILURE

Baku VYSHKA in Russian 19 Sep 79 p 2

/Article by Sh. Mamedov in the column "Economy and Morals": "Costly 'Quality'."/

/Text/ At first there was an idea. Professor A. Kerimov, manager of the laboratory at the Azerbaijan Scientific Research Institute for Power Engineering and now head of the physics department at the V. I. Lenin Azerbaijan Pedagogical Institute, once when meeting T. Kuliyev, director of the TETs-1, said:

"It looks like you are firing the steam boilers with fuel oil. At what pressure do you deliver it to the spray burners?"

"At more than 20 atmospheres."

"Well, suppose you had a new spray burner that would operate at six atmospheres? It would save electricity. Naturally, on-the-job safety would be enhanced."

T. Kuliyev is an experienced production worker. The scientists' idea immediately interested him. Kh. Ismaylov, chief engineer at "Azglavenergo" also liked the ultrasonic hydrodynamic spray burner (UZGDF): preliminary calculations had shown the economic impact of this development. An economic agreement was concluded right then. This was in 1974. As early as the following year scientists and production workers signed a statement for the industrial introduction of this innovation, in which it was noted that the economic impact owing to the fuel oil pressure decrease alone would amount to an average of 50,000 rubles annually. During testing another positive aspect of the UZGDF also appeared: after 3 or 4 months of constant operation the new spray burner did not clog once, in contrast to the centrifugal burners (TsBF's) which must be cleaned almost once a week. In a word, it would seem that fate had favored professor director Kerimov. Only a year had gone by and already it had been introduced into industry. However, we will not beat the drum prematurely. The new burner

had a rather sad end. They still are not using this innovation at the Sumgait TETs-1 (five years have already gone by), although tens of thousands of rubles have been spent on it .

With F. Gasonov, deputy chief of the boiler shop, we walk around the boiler works at the TETs. It breathes fire and steam. Gasonov had since the very beginning been charged with studying the questions involved in introducing this innovation. Here is how he tells it!

"If you would take the project to its end, the ultrasonic burner would be a worthwhile substitution. The tests were run and they announced that the scientists had to elaborate on the burner, just a little bit, but it still had to be done. This is to say nothing of how much we, the production workers, had to do in order to first decrease the fuel oil pressure to six atmospheres, even if only on a group of burners, in order to really get the same economic gain."

Into the conversation comes machinist U. Shukyurov who helped the scientists test the innovation.

"These burners are very convenient to work with and they make the job conditions easier for the workers."

Repeating the firm conviction in the prospects of the ultrasonic burner, Kh. Ismaylov, head engineer at "Azglavenergo," says grievingly:

"No one was able to foresee all the difficulties that cropped up. If the introduction of the burner had been taken on not at the Sumgait TETs-1 with its antiquated equipment, but at the more modern TETs-2. . . "

Knowing this, why then did Kh. Ismaylov not advise the TETs-2 production workers to likewise test the prospective burner at their own station? There was, you know, plenty of time for reflection and re-orientation.

Instead of this, the production workers submitted reports on the industrial introduction of the burner when the introduction, in essence, had not taken place. And, based only on the tests, they submitted "bogus" papers with fabulously high figures for the assumed economic gain.

And when you now ask, how could they deliberately sign false statements, the executives justify it by saying:

"The scientists had to give an account of their work, and so we did them a good deed--we computed the economic impact . . ."

And it is not surprising that some signed false statements and others, knowing it, carefully filed them away. Those funds which had been released for the

development and introduction never did lead to an achievement of the set goal--increasing the operational efficiency of the TETs boiler works.

Years have gone by, and everyone has calmed down. And no one has even taken moral responsibility for what has happened. Meanwhile, the project director, professor A. Kerimov, has long ago departed the Azerbaijan Scientific Research Institute for Power Production for other work. From the looks of things, he has grown cool to the idea of introducing his creation. He has applied himself more to the publication of articles about the ultrasonic spray burner. In a conversation with me he complained about the difficulties.

"No one is against our development in word, but you yourself see what happens in deed."

However, in reply to the question of whether it was long ago that he was last at the Sumgait TETs-1, the professor shrugs his shoulders in embarrassment.

"Where is the way out? A. Kerimov himself whispered to the professor: the Azerbaijan Scientific Research Institute for Power Porduction could have him (the professor) join the work after having him confirmed as project director, regardless of the fact that he is now working at another institute.

For some reason or another, however, A. Kerimov has never addressed the Scientific Research Institute with this proposal . . . The professor knew, of course, that the statements on the introduction of the new burner were formal statements, but he accepted them and then left the institute, having just quit the work on which had been spent the money, time, and efforts of many people.

F. Agayeva, candidate of technical sciences, and M. Aliyeva, candidate of physical and mathematical sciences, having remained at the institute, continue to study this problem. Understanding that the burner's introduction at the TETs-1 had essentially not taken place, and having taken a letter out of the institute, you might say, at their own risk, they brought a set of burners to the TETs-2. It is difficult for F. Agayeva and M. Aliyeva to have their work here confirmed. The director dropped everything half-way, and the institute, having filed statement of formal introduction, considered the burner project completed. The work now is not paid for.

For long years no one in a scientific enterprise nor in industry lifted the veil on this. It does not worry anyone: can you consider the work introduced when it has not brought in a single ruble of profit?

F. Agayeva and M. Aliyeva are given to their scientific duty and considers themselves obliged to carry the work through to the end. They told me how

positively professor A. Gorbaneko of the All-Union Thermotechnical Institute also spoke of the burner, having noted its great economic significance.

However, without serious support from "Azglavenergo" the scientisms will not manage the introduction of this innovation.

In 1976 the administration charged its enterprise "Azenergoladka" to conduct a comparative investigation of the ultrasonic burner and the presently employed centrifugal burner in order to provide the answer: is it expedient to replace the old burners with the new ones? And what of it? Experts from "Azenergoladka" evaluated it positively, but . . . for some reason suggested that a completely new burner be introduced--a SNATI [further expansion not given] (we note that it is just as old as the one that operates at high pressures).

They say that similar dizzying zig-zags around the spray burner are the results of the activities of some opponents of the innovation, who earlier worked in management. Well, what now? Everyone with whom we talk conforms with one voice the fact that the work of the scientists is long-range. If you take the work to its end, it will bring the economy a tangible economic gain.

And what of it? Even today production workers, exhibiting their unscrupulousness, continue to sign papers which are contradictory in content and which sometimes portray the actual state of affairs in a good light, and at other times in bad.

At "Azenergonaladka" in 1979 they drew up a second report on the comparative testing of the burners. This time a simple answer to the question of what to do with the innovation was not obtained. As before, the old inefficient TsBF's are still operating in industry. The SNATI burner they are fighting for at "Azenergonaladka" is also not being used. As far as the ill-fated ultrasonic burner is concerned, it is on the books as an innovation, but has still not been given a start in life.

People are getting the impression that those at "Azglavenergo" don't value their authority very much, that they give away good marks first to this burner, then to that one, if only just to be thought of as kind. In practice, they introduced neither of them.

Kh. Ismaylov, chief engineer at "Azglavenergo," says that they propose to conduct one more comparative test. Whatever results it will give, whoever will receive the next inquiry about the satisfactory outcome of the scientific investigations, is not know. Only one thing is clear; there is a continuation of the red tape in which important State business and resources are drowning. Now is as good a time as any to ask: "is the price of this 'quality' too expensive?"

9512
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ELECTRIC POWER AND POWER EQUIPMENT

APPLICATION OF SOLAR ENERGY IN RURAL AREAS EVALUATED

Alma-Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 7, 1979 pp 55-56

/Article by A. Dzharzhanov, B. Aksenov, B. Churin and A. Yunusov: "Solar Power Stations--In Service to the Village"/

/Text/ On instructions from the G. M. Krzhizhanov Institute of Power Engineering, the Kazakhstan Section of the "Sel'energoproyekt" Institute conducted research in 1972-1977 on the technical and economic expediency of adopting solar power stations (SES's) to the complex supply of electrical and thermal energy to village consumers.

A few words about what an SES is. It is an enormous platform equipped with mirrors (for example, the mirror platform for a 1.5 MW station comprises 20,000 m^2), in the center of which a tower with a steam boiler on top is installed. Solar rays, reflected by the morrors and concentrated on the boiler, convert its water into steam. The latter is sent through pipes to a turbine with a generator which then develops the electric power. This then develops the electric power. This technological scheme is applied for turbines of up to 50 MW capacity.

The SES's can operate on the territory of Kazakhstan south of 50^{o} N latitude, where the intensity of solar radiation is greater than 0.8 kW per 1 m^2. This insures optimal operation of the SES's. Research has shown that SES's can be utilized for complex electrical and thermal supplies to rural consumers, water distillation and electrical supplies to irrigation pumping stations. The natural economic zones for potential application of solar energy have also been marked out: zones for pastured and high-altitude cattle-grazing, irrigation and health resort use.

The expendiency of constructing an SES in a pastured zone for cattle-grazing has been examined on the model of the northern Koktal Balkhash region of Alma-Ata oblast. Based on analysis of the electrical and thermal loads in this zone, it has become apparent that two electric power variants need to be examined. The first is the construction of thermal and boiler networks in which the power source is solid fuel and the electric power supply is

realized through the power system. The second is the construction of an SES and additional 10-35 kV networks and the application of electrical heating devices with heat collectors.

It is well known that a minimum of net expenditures is a criterion of economic effectiveness. In the given case they are determined by the formula:

$$Z = En \times K + I$$

Where Z are the net expenditures; En the standard coefficient of effectiveness of capital investments, equal to 0.12; K, the capital investment; and I, the annual expense.

The net expenditure for a thermal power installation of the second variant (3.46 million rubles) turned out to be significantly higher than for the first variant (1.34 million rubles). Expenses for a power-source distribution scheme in the first variant comprised 1.07 million rubles and 464,000 rubles in the second. Thus, the total net expenditures came to 2.41 and 3.94 million rubles, correspondingly.

Besides this, the losses due to diverting the work force from the agricultural sphere (715,000 rubles for the first variant and 85,000 for the second) and expenditures for housing construction (273,000 and 32,000 rubles, correspondingly) were taken into account. With the calculation of the technological effect (an additional output of electrical energy in the second variant) which amounted to 700,000 rubles, the expenses for the first variant equal 3.39 million rubles, 3.35 million for the second.

Thus, according to the net expenditures, the variants that are being examined are approximately equivalent. However, the exploitation of the SES makes it possible to conserve critical manpower in agriculture and to conserve mineral fuel (in the given example, the fuel savings amounted to 2.32 million tons of conventional fuel per year).

The soundness of adopting the SES in irrigation zones was based upon the example of the Aksuskiy irrigation tract, located in Taldy-Kurganskaya oblast. On a tract of 14,000 square hectares surface are located seven sovkhozes. Here the following variants were analyzed: the first--a complex electrical and thermal energy power supply from a 30 MW SES, with a combined output of electrical energy and heat in the region of the Dzhansugurov 110/35/10 kV substation; the second--electrical power supply from the power system and heat supply from solid fuel boilers.

Comparison of the variants was conducted using an analog method. The net expenditures for the first variant comprised 3.36 million rubles and 4.79

million rubles for the second; that is, the application of the SES in the irrigation zone was 30% cheaper than the utilization of the power system and the solid fuel boilers.

One of the most pressing problems in supplying water to rural areas is the utilization of mineral surface and ground waters, reserves of which are practically inexhaustible. The salty and slightly salty waters, however, are used only after freshening, which, by the way, can be carried out with the help of an SES.

Several variants have been calculated on models of characteristic economics. The first is an electrolyzing installation for water freshening, connected to the power system's electrical network with a fuel-fired boiler for the heat supply. The second is a solid-fuel boiler for freshening and heat supply. A third is a 2500 kW SES for water freshening and electrical and heat supplies, operating in conjunction with the power system's electrical networks.

The application of SES's will be more efficient than other variants under conditions in which more than 150,000 tons of fresh water are produced per year.

The expediency of using SES's in mass recreational areas was examined using the model of one of the health resort regions of Lake Issyk-Kul'. The results obtained are extending also to the Kazakhstan recreational zones located in the south of the republic, such as Saryagach, Kapchagay and others.

Two variants have been analyzed: in the first, heat supply to the consumers was accomplished through a thermal network of three boilers operating on liquid fuel; in the second, electrical and heat supplies come from an SES.

Calculations have shown that expenditures for the second variant exceed expenditures for the first by 23% (268,000 and 349,000 rubles). However, the ever-increasing demands for protecting the environment and, in particular, the purity of the water dictate the necessity of using SES's for power supplies in recreational zones.

The examples cited indicate that SES's can be used in the long run for the power supply to agricultural consumers. In light of this, the Kazminsel'khoz should study the question of utilizing SES's in pastured and high-altitude cattle-grazing zones; the Ministry should study the question of land-reclamation and water resources management in zones of mechanized irrigation, and the Kazsovprof in mass recreational zones located in the southern oblasts.

9512
CSO: 1822

NEW UNIT INSTALLED AT NUREK GES

Moscow IZVESTIYA in Russian 22 Sep 79 p 2

[Photo caption]

[Text] The latest unit to be installed at the Nurek GES construction site is this, the 9th unit, with a capacity of 300,000 kW. It is successfully being finished by a "work relay" that arose here. Many builders have already left for the construction platform where the Rogunskaya GES, largest in Central Asia, is being erected.

9512
CSO: 1822

ELECTRIC POWER AND POWER EQUIPMENT

DEVELOPMENTS IN SOLAR POWER PRODUCTION OUTLINED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 2 Sep 79 p 2

/Article by N. Lidorenko, member-correspondent of the USSR Academy of Sciences and S. Ryabikov and D. Strebkov, candidates in technical sciences: "From Prognosis to Practice"/

/Text/ The earth's radiation cycle is balanced. The possibility is not ruled out, therefore, that if we produce more than one percent additional energy than that which we now receive, it might lead to a violation of the planet's thermal balance. In order to avoid this, as the experts reckon, in a few decades we will have to produce energy only from renewable sources: the sun, wind, sea waves and the heat of the Earth. The problem of direct utilization of the sun's solar energy will become one of the basic problems. In significance it may be compared to the problem of a controlled thermonuclear reaction.

Since long ago mankind has used solar energy that has been stored in fuel and food products as a result of photosynthesis. However, the efficiency of the natural "solar-energy-photosynthesis-fuel-electrical energy" cycle is very low, less than 0.01%. Specialists have learned to manufacture photoelectric transformers of solar energy on the basis of semiconductors. These transformers or, as they are called, "solar batteries" (SB), occupy a leading position in the energy supply systems of space apparatus. The efficiency of the best batteries reaches 18 to 20%. It has been shown that it can be raised to 30 and even 93%, although the efficiency already achieved with solar batteries is commensurable with the efficiency of an automobile engine.

However, there are still quite a few problems standing in the way of a broad application of solar energy. The existing batteries are, for the time being, very expensive. Even our sun itself sends us radiation of low density. Moreover, it is dependent upon the time and the weather. It is considered economically justified to use SB's for supplying current to autonomous users of low power (up to several kW) operating in an automatic mode in areas removed from a centralized electrical power

supply network. In the meantime they are being served by direct electrostations and gasoline-powered units, reserve battery power and galvanic piles. Just recently at the Minelektrotekhprom enterprises experimental models of solar-powered electrostations (SES) were developed, based on photoelectric modules within gas-filled protective glass casings. They are now undergoing operational-research and resource testing. More than 70 SES power units, ranging in power from 5 to 500 watts, are in operation on bouys and navigational markers on the Barents Sea, the Rybinskiy reservoir, Lakes Baykal and Ladoga, the Black Sea, the Sea of Aral, on the UHF radio-relay line for the Central Asia-Center gas line, at water-raising complexes and at power supply systems for "solar" homes. The efficiency of such electrostations is 7 to 8% and the projected period of service is 30 years. As 10 years of operational experience have proven, the substitution of traditional sources of energy by autonomous SES's has significantly lowered labor losses due to servicing and saves fuel.

A permanent price reduction in the cost of solar batteries and an increase in the cost of fuel steadily expands the areas of application of SB's in power engineering. We are informed in the press that they are being employed for supplying power to an airplane's electric motor. They are also being used for changing the batteries of an electric car. In the future, SB's will be able to supply current to electronic devices for home use: calculators, portable radio receivers, televisions, tape recorders and watches. An electrostation with a direct solar-to-electric energy transformer with the help of silicon SB's might be successfully employed in practice in any geographic area. They are reliable in operation, and the resource for their operation is extremely great. Finally, they are ecologically absolutely clean.

The basic problem in photoelectric power engineering right now is decreasing the cost of the specified output and electric power of SES's. A land-based silicon SES is approximately 100 times more expensive than an atomic power station. They can be made cheaper. In the first place, it can be done owing to a decrease in semiconducting materials and automated production and, in the second place, by a utilization of concentrated solar radiation.

Silicon, after oxygen, is the most common element on Earth. Giant deposits of silicon (sand) are almost everywhere. The content of the basic impurities is very small. The problem for the scientists is to develop a clean process for deoxidizing the silicon dioxide.

In 1970 Soviet scientists suggested using concentrated solar energy for increasing the efficiency and decreasing the cost of SB's.

In the Soviet Union, for the first time anywhere in the world, a 1.1 volt potential was achieved in a silicon photoelement during the course of experimentation. This confirms the feasibility of raising the efficiency up to 30% or more. A 32 kV SB has been developed and tested.

In accordance with the national program of solar energy development the U. S. Department of Energy, in contract with firms, is financing the development of 17 solar electrostations of various capacities with the completion of construction in 1980-81. Long-term programs for the development of land-based solar power production have also been developed in our country. The basic problem is to create the technological processes for the production of economical SES's and prepare the scientific potential and the industrial base. New high-temperature solar furnaces have appeared, and also experimental solar stands--prototypes of solar homes. In Central Asia and in the south of the European portion of the USSR, construction is planned for one- and two-storey housing and a large-scale health spa complex which will be supplied as much as possible with energy from the sun.

However, regardless of the achievements of theoretical and experimental research, the development of solar power production in our country in the creation of new designs and technology meanwhile is essentially lagging behind the demands of the economy. What could and should be done in order to overcome this lag?

At present interministry plans have been prepared and are being examined--plans which provide for the development of new technology, the construction of test stands and experimental SES power units. Obviously, the USSR Gosplan and the GKNT must take care of this, so that they can be confirmed as soon as possible. The scientifically based methods for calculating the economic effectiveness of SES application, are slowly being worked out by the VNII (All-Union Scientific Research Institute) for Complex Fuel and Power Production Problems Under the USSR Gosplan.

A simple calculation shows that a 1 kW SES saves a ton of conventional fuel per year. Such an amount of solar energy is received by the roof of a farm house in the central and southern latitudes of the USSR, that it would be enough for the power supply for all its inhabitants during the course of a year. If only 10% of the fuel used in housing power supplies was replaced with solar energy, we could save more than a billion rubles per year throughout the country.

The energy of the sun, thanks to its enormous reserve and the simple technology for utilizing it, can become a vital component in the USSR's power production balance by the end of the present decade, and will make possible an all-round solution to the technical-economic and ecological problems of the future.

9512
CSO: 1822

BRIEFS

HOME SOLAR HEATING--When the sun's rays contact the roof of this house, heated water begins flowing into the radiators of the heating system. After 45 minutes the three-room apartment is supplied with heat. The design for a home heated by solar energy was drawn up at the Tbilisi Zonal Scientific Research and Design Institute of Standard and Experimental Designs for Domestic and Public Buildings. Such buildings are planned for construction in the south of the country. One of the roof's slopes is glassed-covered and equipped with a layout of solar ray collectors. They gather the energy and convert it into heat sufficient for domestic needs. Hot water flows not only into the heating banks and pipes installed in the walls and partitions, but also is gathered in storage tanks arranged in the basement. Thus, the heat supply to the home is not interrupted, even during the night. In periods of bad weather, ordinary gas and electric water heaters are in operation. The first such experimental home is planned for construction in the vicinity of Tbilisi. /Text/ /Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 14 Sep 79 p 2/ 9512

INSTALLATION OF GRES COMPUTER--An "EES-1030" universal computer was installed at the Konakovo GRES. The new electronic helper will take upon itself a number of industrial and economic concerns: optimal planning of repair work on the power units, fuel delivery accounting, GRES personnel payrolls, basic fund accounting, processing of statistical data and much more. The computer will replace dozens of people employed in the management sphere. At present nine power stations are equipped with automated control systems and six more are to be added by the end of the Five-Year Plan. /Text/ /Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 22 Sept 79 p 3/ 9512

UNDERGROUND EQUIPMENT AT GRESS--Sinegor'e, Magadanskaya oblast--Builders at the Kolymskaya GES have finished laying concrete for the station's machine room. It is being built in the depths of the cliffs on the left bank of the river. The station's first turbines installed in this fifty-meter high underground grotto should be providing current as early as next year. In order to assist these northerners in insuring that the units are put into operation on schedule, detachments of hydraulic construction workers from Soviet Georgia, Kazakhstan, Tadzhikistan and Kirghiz have arrived here. /Text/ /Moscow MOSKOVSKAYA PRAVDA in Russian 21 Sep 79 p 1/ 9512

AIR-SEPARATION UNIT--Production of an experimental prototype of an air-separation unit for obtaining liquid oxygen and high-purity nitrogen has begun at the Kislorodmash Scientific Production Association. This complicated piece of equipment, which was designed by workers at the enterprise, will be used in atomic electric power stations. [Text] [Kiev PRAVDA UKRAINY in Russian 29 Sep 79 p 1]

NIZHNEKAMSKAYA GES--Construction work continues at the Nizhnekamskaya GES, the last stage in the Kama River power chain. The first unit, which has a capacity of 80,500 kilowatts, is already in operation at the station. The fitters and operators at the GES pledged that they would have the hydraulic power station's second unit in operation by the 62d anniversary of the October Revolution. [Text] [Moscow STROITEL'NAYA GAZETA in Russian 26 Oct 79 p 2]

TERIBERSKAYA GES--Filling of the dam for the Teriberskaya GES has begun a month ahead of schedule. The builders are faced with putting in place about 2 million cubic meters of soil and 5,000-10,000 cubic meters of concrete. The Teriberskaya GES will be the 17th hydraulic power station in Murmanskaya Oblast. It will carry loads during peak hours and make it possible to use all the electric power stations in the Kol'skaya power system more efficiently. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 13 Oct 79 p 1]

SPANDARYANSKAYA GES--The first cubic meters of soil were removed from the foundation of the Spandaryanskaya GES's machine room almost a month ahead of schedule. The main stage of the construction of the third and final stage of the Vorotanskiy power chain has begun in the Zangezura Mountains. The collectives that finished building the vertical turbine water conduit and prepared the bed for the future reservoir made sure of their accelerated work schedule. The hydraulic engineering construction people are confidently approaching the start-up date of this powerful electricity-producing complex, which is set for the end of this five-year plan. The high rates of power engineering development have made it possible to set up energy-intensive enterprises throughout the republic that are engaged in chemistry and machine building, metallurgy and electrical engineering, electronics and motor vehicle building. The amount of electricity generated in the republic now exceeds 11 billion kilowatt-hours per year. Part of it is sent into the Unified Trans-Caucasus Power System. [Text] [Kishinev SOVETSKAYA MOLDAVIYA in Russian 20 Sep 79 p 1]

ELECTRIFICATION IN KRASNOYARSKIY KRAY--Electricity from the Nazarovskaya GRES will help speed up the exploitation of the

Lower Priangar'ye's natural riches. It began to arrive in Severo-Yeniseysk yesterday, over a new 220-kilovolt power transmission line. [Text] [Moscow TRUD in Russian 1 Nov 79 p 1]

SUPERPOWERFUL TRANSFORMER--Assembly of a superpowerful power transformer -- 1 million kilovolt-amperes -- has begun in Zaporozh'ye, at the leading enterprise of the Zaporozhtransformator Production Association. This new unit is intended for the Ryazanskaya GRES, where it will be used with a power-generating turbine having a capacity of 800,000 kilowatts. Use of this transformer will reduce the GRES's construction cost by 144,000 rubles, and the total economic effect of its utilization will exceed 350,000 rubles. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 18 Sep 79 p 1]

GENERATOR STATOR--An unusual train has arrived at the construction site of the Kostromskaya GRES. A special 32-axle transporter was used to deliver (from Leningrad) the generator stator for the country's first electricity-producing unit with a capacity of 1.2 million kilowatts. In order for the stator to be delivered, the roadbed had to be rebuilt in some places and bridges had to be strengthened. The second stage of the operation will begin at the Kostromskaya GRES in a few days: installing the gigantic stator on the foundation that has been prepared for it in the electric power station's main building. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 28 Oct 79 p 1]

SAYANO-SHUSHENSKAYA GES--A 200-meter transportation tunnel to the upper levels of the Sayano-Shushenskaya GES's dam has been completed one and a half months ahead of schedule. The new path for concrete carriers, which was driven through rock on the right bank of the Yenisey River, will accelerate the construction of the high dam considerably and make it possible to make up time. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 15 [illegible] Sep 79 p 1] The hydraulic engineering construction workers at the Sayano-Shushenskaya GES are preparing to start its second unit by the anniversary of the Great October Revolution. The height of one of the units has reached 125 meters. This is higher than the crown of the dams at the Bratskaya and Krasnoyarskaya GES's. The Sayan builders have only reached their "equator": the planned height of the dam is 240 meters, and its volume will be almost 10 million cubic meters of concrete. The level of the Sayano-Shushenskaya GES's reservoir is rising along with the dam. It now contains 3 billion cubic meters of water. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 1 Nov 79 p 1]

LENINGRADSKAYA AES--A physical start has been achieved for the third reactor at the Leningradskaya AES imeni V.I. Lenin. The new power unit's capacity is the same as that of the two already in operation: 1 million kilowatts. "In a month we will have completed an extensive cycle of experimental research," said A. Yeperin, the station's chief engineer, in commenting on this event. "After the reactor's physical parameters are accurately defined, it will gradually be brought up to its rated capacity. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 19 Sep 79 p 1]

ELECTRIFICATION IN KALMYK ASSR--On the threshold of the anniversary of the Great October Revolution, electricity from the Tsimlyanskaya GES arrived in the remote Kalmyk village of Oktyabr'skoye in Yashaltinskiy Rayon. The 30-kilometer high-voltage power transmission line, which went into service half a month ahead of schedule, was erected and released for operational use by installers from the Rostovenergosel'stroy trust's PMK-64 unit. [Text] [Moscow TRUD in Russian 26 Oct 79 p 1]

NEW FUEL COMBUSTION METHOD--Leningrad TETs's began to operate more efficiently after specialists used an original method for burning fuel in the furnaces at temperatures that are lower than usual. Scientists from the Leningrad Polytechnic Institute proposed a new method of feeding coal into furnaces in which the crushed fuel moves along a vortex-shaped trajectory. The steam generators' efficiency improved and toxic discharges were reduced as a result. The need for careful pulverization of the fuel also became superfluous. This is a substantial gain when one takes into consideration the fact that a TETs's grinder consumes up to 1 percent of the electricity generated by the station. The scientists' plans have already been used to remodel 30 steam generators in Leningrad, Sverdlovsk and Kirov. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 5 Oct 79 p 2]

ELECTRIFICATION IN THE TRANS-BAYKAL--The first kilometers of taiga have been cleared on a route through the spurs of the Soktakhan Range. Construction has begun on a high-voltage power transmission line that will carry electricity from the Zeyskaya GES to projects on the Baykal-Amur Main Line. A 220-kilovolt line almost 190 kilometers long will connect the GES and the new settlement of Zeysk by the shortest possible route. Over rocky spurs and through swampy morasses, the builders will set hundreds of poles in place and then hang from them the wires over which electricity will flow to the [illegible] being newly developed in the northern part of the Priamu[illegible]. [Text] [Moscow IZVESTIYA in Russian 12 Sep 79 p 2]

DAM AT TERIBERKA GES--Teriberka settlement, Murmanskaya oblast--Yesterday pouring began a month ahead of schedule at the construction site of the dam for the Teriberka GES. About 2 million cubic meters of earth need to be laid in and about 50,000 cubic meters of concrete. The Teriberka GES is the 17th hydrostation in Murmanskaya oblast. [Text] [Moscow TRUD in Russian 13 Oct 1979 p 1] 9512

BRIDGE OVER NARYN--Kara-Kul', Kirghiz SSR--A traffic bridge across the Naryn was erected considerably ahead of schedule at the Kurpsayskaya GES construction site. The first automobiles crossed it yesterday. When the station is put into operation the production of electrical energy in the republic will increase by one third. [Text] [Moscow TRUD in Russian 13 Oct 1979 p 1] 9512

MILLION-KILOWATT GENERATOR--Leningrad--At the "Electrosila" association they have begun making the country's first million-kW AES generator. This is an important step in the business of fitting atomic power stations with the most economical power equipment. Up to now million-kW reactors operated in pairs using two 500,000 kW generators. Doubling their output makes it possible to decrease the unit cost of energy produced at the AES, owing to a decrease in the amount of metal used in the units and a reduction in the capital investment in the station's construction. The first million-kW generator is ear-marked for the South Ukrainian AES. [Text] [Moscow MOSKOVSKAYA PRAVDA in Russian 20 Sep 1979 p 1] 9512

AES ON THE KAMA--Ufa, 3 Oct--A decision has been adopted to build an atomic power station in the Bashkir ASSR. The energy of the new "terrestrial sun" is intended for cities and villages of the Urals and the Povolzh'ye. The station's output will be four to six million kW. It will rise on the river Kama not far from the city of Neftekamsk. Construction of the AES has been charged to the "Bashuralenergostroy" trust. [Text] [Moscow PRAVDA in Russian 4 Oct 1979 p 6] 9512

CSO: 1822

COAL INDUSTRY SHORTCOMINGS NOTED

Moscow PRAVDA in Russian 14 Oct 79 p 2

[Article by S. Zayganov, chief of the technical division, M.A. Kablashov, chief technologist of the mining division, B. Korneyev, secretary of the party organization, and V. Morozov, chief of the mining division of the Sibgiproshakht Institute, Novosibirsk: "On Mining Engineering"]

[Text] Letter to PRAVDA

The Sibgiproshakht Institute is the head institute for planning coal industry enterprises in the Kuznetsk, and Southern Yakutsk basins and the Kansk-Achinsk fuel and power complex. It is well known that the intensity of building operations, and the speed of assimilation of production capacities depend on the quality of the plan.

Our country's interior is rich in useful minerals, but their reserves are not unlimited. And the fact of how the "sunstone" is extracted, is expended, worries not just the miners.

The future of the Kuznetsk Basin is well known. By the end of the nineties here there should be 50 mines with an average capacity of 2.8 million tons and 20 open pits with 6.5 million tons of extracted coal per year. The prospects are gratifying. But the question is now to overcome the obstacles on the way to the planned targets. The first and, perhaps, the most serious of these is the slow rates of refurbishing and construction. According to the plan the duration of reconstruction of mines with a capacity of up to 3 million tons comes to 5-7 years. In fact for various reasons it is drawn out for three-fold longer. The situation which has become established in the basin forces enterprises independently to decide questions of uncovering and working new layers according to a temporary scheme. As a result the losses of coal in the mines increase, and the effectiveness of production is reduced sharply.

According to a plan of reconstruction and amalgamation with the Surtaikha mine, the Taybinskaya mine should have begun to operate in 1975 and

produce 2.4 million tons of coal per year. However due to the inadequate capacity of the Kiselevskshakhtostroy Trust the introduction of the enterprise was postponed to 1981. By this time the Surtaikha mine will completely mine the reserves of coal in the lower layer. Thereby the attainment of the planned capacity is ruled out.

Not putting refurbished or new mines into operation on time leads also to obsolescence of the technology adopted by the plan, and to partial replacement of installed equipment. The planning organization has to review its decisions and again prepare the technical specifications. The estimated cost of construction inevitably is increased.

In our opnnion, it is necessary for the USSR Ministry of the Coal Industry to strengthen the mine building organizations. They are not meeting their assignments not only in the Kuznetsk Basin, but in the whole sector. Therefore violations of the normative deadlines have also become common. But the national economy's demand for fuel is increasing every year.

In turn we, the planners, are called upon to outstrip today's level of production, to base our decisions on the most advanced technology and equipment. However we depend on the scientists and designers, for we put in the plans not our own good wishes, but those innovations which already actually exist. Unfortunately, in a number of cases there is a great lack of development of progressive technology, of industrial production of equipment for full mechanization of working and preparatory operations.

Let us return to the Taybinskaya mine. The plan for refurbishing it provided for the use of a mechanized complex of the KZ type with packing of the worked space with barren rock. The scientific research and planning and design organizations of the sector worked on setting up this complex for 15 years, however they were not successful. Inefficient working systems are in operation at the mine. The losses of coal in the mines have increased two-fold against the plan. All the technico-economic indicators have gotten worse.

Certainly noone is insured against failures. But there are so many of them that it is necessary to state: scientific and design ideas still have not solved the fundamental problems of economical and effective utilization of the natural wealth of the Kuznetsk Basin. The situation in the Prokop'yevsko-Kiselevskiy Rayon of the basin is especially alarming.

Extended investigations have shown that the only correct way of extracting coal from the high-capacity steep contiguous beds of this region is by working the reserves with complete packing of the freed space with barren rock, with compulsory mechanization of all labor-intensive processes. Such technology will make it possible considerably to reduce the losses of coal in the mines, and sharply to increase the safety of mining operations and will create good working conditions.

The scientists have proposed to the designers systems of working the beds with hydraulic, pneumatic and reinforcing packing, with complexes and combines of new types. These innovations have been tested at the mines for many years, but up to now not one of the systems mentioned has been brought up to industrial readiness.

We understand that it is not a simple task. The region's mining and geological conditions are very complex. Its main feature is that concentrated here are rich reserves of coking coal of very valuable grades. This is the pearl of the basin. There is no doubt that with proper organization of the matter the problem can be solved.

The misfortune is that the forces of the scientists and designers are separated, they are not coordinated. The task of creating equipment for mines of Prokop'yevsko-Kiselevskiy Rayon was given to the small collective at the Sibgiprogormash Institute. However it is not in a position to cope with this task. Also telling is the unjust distribution of responsibility for the end results of a many-stage labor--some of its participants are made strictly responsible, others remain on the side, even if their proposals turn out to be unsound. But yet these proposals have been put in the plans, they have determined state technical policy!

Certainly, thrift is the law for all. And a situation like the one at the Raspadskaya mine cannot be tolerated. Utilized there is a complex which leaves in the roof of the bed a batch of coal with a capacity of 80 centimeters. Lost in the depths is about 4 million tons of fuel per year. There would be enough of these reserves for operation of a whole mine for seven months. Irretrievable losses increase the probability of underground fires. And the whole thing is that the industry did not assimilate the output of a new complex on time.

The miners have this term: the coefficient of extraction. For the Prokop'yevsko-Kiselevskiy Rayon it comes to 0.7 according to the plan, but in fact it is 0.37. That is, only 37 tons is extracted out of every 100 tons of coal. This is the kind of consequence resulting from the lag in the development and series production of new equipment, in the rebuilding and construction of mines. This is where we are losing the precious gift of nature!

All these questions deserve especial attention from the USSR Ministry of the Coal Industry. And it is necessary to solve them more rapidly, because they are connected with the saving of fuel.

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OIL FIELDS NEED BETTER ELECTRICITY SUPPLY

Ashkhabad TURKMENSKAYA ISKRA in Russian 18 Oct 79 p 2

[Article by V. Lobzeyev, chief of a service of the Rayon Nebitdagenergo Administration: "Energy Supply for the Oil Fields"]

[Text] The Nebitdagenergo Administration supplies electric power to all rayons of Krasnovodskaya Oblast. It supplies such important sectors of the national economy as the oil and gas extracting, oil refining, chemical, the enterprises transporting oil and gas through pipelines, and kolkhozes and sovkhozes. The supply of electric power to the population of Krasnovodsk, Nebit-Dag, Bekdash, Cheleken, Kazandzhik, Kizyl-Arvat and other rayon centers is increasing steadily. The needs of the oil workers and gas workers of Okarem, the residents of Gasan-Kuliyskiy and Kizyl-Atrekskiy rayons are met by the isolated Okaremskaya electric power plant. A diesel electric power plant is operating in the settlement of Kizyl-Kay.

We obtain a certain amount of electric power from the united power system of Central Asia. Remaining its basic suppliers are the Krasnovodskaya Heat and Electric Power Plant and the Nebit-Dag gas regional electric power plant, the potentials and capacities of which are now being used to the limit.

However the rapidly developing economy of Krasnovodakaya Oblast with every passing year requires more and more electric power, especially for such sectors as oil extracting, oil refining and chemistry. In connection with the conversion of dozens of wells to the mechanized method of oil extraction there has been a sharp increase in the demand for power by the Turkmenneft' Production Association. The capacities have increased at the Nebit-Dag Iodine Plant and other enterprises.

In a word, the demands for energy are increasing every year and they, unfortunately, are not always being satisfied. This has been felt especially perceptibly in recent months in connection with the planned repair of power blocks at the Krasnovodskaya Heat and Electric Power Plant. This has led to downtime of capacities at enterprises in the oil and gas extracting, oil refining and chemical industries, in those transporting oil and gas, in agriculture and others.

At this time the planned repair at the Krasnovodskaya Heat and Electric Power Plant and the Nebit-Dag Gas Regional Electric Power Plant is winding up. It was performed with good quality and in the set time. But nevertheless the acute nature of energy supply remains.

A definitive solution of this important national economic problem is connected with new capital construction, with the introduction of new capacities and high-voltage lines. This is a matter of install ng new power blocks at the Krasnovodskaya Heat and Electric Power Plant, one of which should go into operation in 1980. The executor of the work is the Uzbekgidroenergostroy Trust, which has its administration in Krasnovodsk. Expansion of the heat and electric power plant has been started, but it is being done slowly, haphazardly.

The construction of the high voltage line from Kazandzhik to the Kotur-Depe gas compressor station is being performed just as unsatisfactorily. This line will make it possible to supply oil to the region better from the united power system of Central Asia. The planning documents for this project were ready long ago, the means have been released. This year alone the builders in the Spetssel'stroy trust should use 3,200,000 rubles. But in nine months the Nebit-Dag mechanized column and other subdivisions of the trust have done work worth not more than 200,000 rubles.

Obviously it is necessary for the builders to review their attitude toward the important projects entrusted to them, on which the further development of the republic's oil, gas and chemical industries are greatly dependent.

It is necessary also to build and put into operation a high-voltage line from the Krasnovodskaya Heat and Electric Power Plant-2 to the gas compressor plant in Kotur Depe.

In order to provide power for new facilities of the national economy in Krasnovodskaya Oblast, and to reduce the loss of electric power it is planned to carry out a large volume of network construction. In particular, for Kara-Kalinskiy Rayon, which is primarily agriculture, in 1981 it is planned to build a 110 kilovolt electric power line from Kizyl-Arvat to Kara-Kala. Presently being built is the 110-kilovolt electric power line from the Nebit-Dag Gas Regional Electric Power Plant to Kum-Dag to provide power for existing and new deposits for the oil and chemical industries. At the beginning of the 11th Five-Year Plan it has been decided to build a new substation in Kum-Dag and also the Kum-Dag--Gograndag--Okarem 110-kilovolt electric power line and two substations.

The output of power for the Krasnovodsk Oil Refinery and the population of the Krasnovodsk spit will be increased owing to a substation which also is to be built in the new five-year plan. Also planned is the construction of other substations and electric power lines, which will transmit power to residential regions of cities, and to such important facilities as the centralized water pipeline of Krasnovodskaya Oblast which is under construction, reclamation stations on the Karakum Canal imeni V.I. Lenin,

the vegetable and dairy sovkhoz near Nebit-Dag, the Monzhukly deposit of syr'yevyye [mineral?] waters, animal husbandry complexes, and so on.

Planned for the same period is the introduction of two new power blocks with 200,000 kilowatts at the Krasnovodskaya Heat and Electric Power Plant, and the replacement of gas turbines with new ones at the Nebit-Dag Gas Regional Electric Power Plant. It is also proposed to provide central heating in the city of Nebit-Dag in the future.

It is important that these plans be carried out together at all sections simultaneously and in the set periods. Construction and installation work is now underway to supply heat to Krasnovodsk from TETs-2 [heat and electric power plant-2]. Assembly of a section of the hot water supply heating line 1.8 kilometers long has already been completed. But workers in the city's municipal economy have not prepared the homes for the receipt of thermal energy and the line that has been laid is not being used. Thus, the money spent is not giving any return. During the summer in Nebit-Dag air conditioners are turned on everywhere--the consumption of electric power increases sharply. Taking this into account, back at the beginning of the year the Nebitdagenergo Administration worked out the necessary technical measures, implementation of which will make it possible to prepare the municipal network for the increased loads. It has been planned to introduce new transformer substations, and to replace the wiring in apartment buildings and city blocks. There is much to be done by the workers of the Turkmenneft' Association, the Turkmenneftestroy Trust, the iodine plant, the Administration of Turkmen Trunk Oil Pipelines and others. However up to now the work has not been started, and while there is a lot of it, it is specific and urgent.

The prospects of energy supply in Western Turkmenia are very promising. But at the present time a difficult situation has taken shape. It is necessary to insure the strictest economy regimen. Workers in the Nebitdagenergo Administration have repeatedly directed the attention of managers of the Turkmenneft' Association, the Krasnovodsk Oil Refinery, the Zakaspiytransgaz Administration and others to the necessity of conserving energy resources. However, as is shown by inspections and checks, at these enterprises the work for rational and economical use of electric power is being performed inadequately.

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